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ABSTRACT

The ability of 23 educable mentally retarded children (mean chronological age, 9 years) to transfer verbal elaboration techniques to a labeling task was tested following one, two, or no elaboration experiences. An additional 18 retardates were tested in two outside control conditions to identify the effects of reversal experience on acquisition and transfer. Since analysis of first trial errors and trials to criterion revealed no differences in performance attributable to reversal experience, the two outside control group conditions were combined with the appropriate experimental conditions for further statistical analyses. Data showed that, relative to the performance of Ss not receiving elaboration experience, those receiving one elaboration experience showed little evidence of transfer while those receiving two elaboration experiences revealed a quite clear transfer performance. Findings were discussed in terms of the failure of previous studies to document transfer of training. (Author/GW)

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VERBAL ELABORATION AND THE PROMOTION OF TRANSFER OF TRAINING IN EDUCABLE MENTALLY RETARDED CHILDREN

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Abstract

The ability of 23 educable retarded children to transfer verbal elaboration techniques to a task in which they were only required to label was tested following one, two, or no elaboration experiences. An additional 18 retardates were tested in two outside control conditions, which were used to identify the effects of reversal experience (R-S recall) on acquisition and transfer. Since analysis of first trial errors and trials to criterion revealed no differences in performance attributable to reversal experience, the two outside control conditions were combined with the appropriate experimental conditions for further statistical analyses. Relative to the performance of subjects not receiving elaboration experience, those receiving one elaboration experience showed little evidence of transfer while those receiving two elaboration experiences revealed quite clear transfer performance. The relevance of these findings to previous failures to find transfer and their implications for educational practice are discussed.

Verbal Elaboration and the Promotion of Transfer of Training in Educable Mentally Retarded Children[1]

James E. Turnure and Martha L. Thurlow
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The oral presentation of noun pairs within a sentence context has proven to be an effective elaborational technique for facilitating paired-associate learning (see, for example, Jensen & Rohwer, 1965; Rohwer, 1966). Furthermore, such verbal elaboration procedures have been found to produce striking increases in the paired-associate learning efficiency of mentally retarded individuals (cf. Jensen & Rohwer, 1963b). Although retarded individuals may require a large number of repetitions to learn a traditional list of paired-associates, when they are provided with experimenter-generated sentences combining the pairs, subsequent learning is almost immediate (Jensen, 1966).

In light of these studies and others (cf. MacMillan, 1970; Martin, 1967), it has been suggested that retarded children might not be able to spontaneously produce verbal elaborations on their own, and so might appropriately be characterized as having a production deficiency (cf. Flavell, 1970). Recent studies (Taylor, Josberger, & Knowlton, 1971; Taylor, Josberger, & Whitely, 1971), however, lead one to question this characterization, since they have shown that retarded children are able to produce their own elaborations when given sufficient training in this skill. Whether retarded children can appropriately be characterized as deficient in production abilities or not, clearly they cannot be characterized as suffering from a mediational deficiency of an inherent, unremediable type, since

they are capable of utilizing experimenter-provided elaborations to mediate associations between noun pairs to be learned.

The positive results of studies providing elaborations led researchers to hypothesize that after adequate experience with the learning facilitation provided by elaborative contexts, retardates might retain and transfer the technique and transfer it to subsequent paired-associate learning tasks. In other words, it was suggested that once retarded individuals had learned a list of sentence-elaborated word pairs, they would utilize an elaborational strategy (i.e., produce sentences relating the nouns and use them to learn the pairs) when later asked to learn a new list of word pairs not presented in an elaborative context. Several attempts to demonstrate this type of transfer in retarded individuals, however, have been unsuccessful (Jensen & Rohwer, 1963a; Milgram, 1967).

Jensen and Rohwer (1963a) gave a paired-associate task to adult institutionalized retardates under either an elaboration condition or a control condition. When the two groups of subjects were retested 10 to 12 days later with new lists, they did not differ significantly from each other in the mean number of errors made on the retest. More recently, Milgram (1967) attempted to demonstrate transfer effects in institutionalized retardates by modifying the Jensen and Rohwer paradigm in order to enhance the effects of an elaboration task and to increase their potential for transfer. In a single experimental session, Milgram attempted to train his subjects to use and transfer elaboration techniques by giving them three paired-

associate lists to learn under varying degrees of elaboration (experimenter-provided elaboration, subject-generated elaboration, and no elaboration instructions). Although the retardates benefited significantly from the elaboration instructions during the first week's training, Milgram found that they were no better than subjects who had not been given the elaboration training when asked to learn a comparable list one week later without the specific instructions to elaborate.

Both Jensen (1966) and Milgram (1967) have interpreted the poor performance of retarded subjects on a transfer list as reflecting their inability to spontaneously elaborate. At least three other possible reasons for the failure to find transfer effects might be suggested, however. In the first place, both studies employed retarded subjects with a history of institutionalization. Many studies (cf. Baumeister, 1968; Zigler & Butterfield, 1966) have demonstrated, however, that institutionalization has potent detrimental effects on the learning performance of retarded individuals. Furthermore, because of unspecified selection factors operating on the general population of retarded children which result in only a small proportion of them entering and remaining in institutions into adulthood (Turnure & Walsh, 1971), studies employing institutionalized individuals are probably studying subjects predominantly representative of a population of organic retardates (i.e., individuals whose diagnosis includes some physiological sign of central nervous impairment), rather than the population of undifferentiated or familial retardates (cf. Zigler,

1966). It is possible that retarded individuals suffering organic impairment might perform differently on an elaboration task (cf. Turnure, Larsen, & Thurlow, 1971, Study I) and possibly also on a transfer task, than the population of familial retardates. Such performance differences could, therefore, mask any evidence of positive transfer by those familial retardates residing in the institutions sampled. A study of educable retardates retained in the public school might find transfer effects not generally obtainable in institutionalized retardates.

A second possible reason for past failures to find transfer of elaboration training might be that the elaboration contexts employed (simple sentences) were not optimal for enhancing learning efficiency to a degree that would induce subjects to transfer on subsequent tests. Rohwer (1966, 1968) and others (cf. Levin, 1970; Montague & Wearing, 1967; Turnure, 1971; Turnure & Walsh, 1971) have suggested that certain elaborations might facilitate paired-associate learning more than others. If this is the case, the use of elaborations more facilitative than the simple sentence might allow for transfer effects to be found.

Finally, it is possible that in providing subjects with only one session of elaboration experience neither Jensen and Rohwer (1963a) nor Milgram (1967) gave sufficient elaboration experience to provide a basis for transfer to occur. Two or more sessions of elaboration experience, possibly with more than a few minutes break between sessions (cf. Milgram, 1967), may be needed to promote transfer in retarded individuals.

A recent study by Turnure and Walsh (1971) suggests that transfer effects might be obtained when these three conditions are met. Assuming negligible transfer effects from elaboration instructions (as implied by both the Jensen and Rohwer, 1963a, and the Milgram, 1967, studies), they examined the effects of three elaboration conditions (Labeling, Sentence elaboration, and Paragraph elaboration) using a Latin square with repeated measures design. All educable retarded subjects were exposed to the three conditions, in various orders, with an interval of at least one week between exposure to each condition. Although no carry-over effects were expected, a significant Condition X Day interaction emerged. Further investigation of the data led Turnure and Walsh to suggest the possibility of significant transfer of training effects from the elaboration conditions (sentences and paragraphs) to the Labeling condition. A subsequent study by Turnure (1971) again found that the extended form of elaboration (the two-sentence paragraph) significantly facilitated paired-associate learning beyond that of a simple sentence. These findings indicate that a paragraph might be a better elaboration to use in attempting to obtain transfer effects, and, together with the indications of a recent pilot study (Turnure, et al., 1971, Study II), suggest the need for further investigation of the effects of repeated experience in the use of verbal elaboration, specifically with non-institutionalized retardates and with an extended form of elaboration.

Further analysis of the procedures used by Turnure and Walsh revealed that reversal performance (the ability of the subject to give

the name of the stimulus item when shown the corresponding response item) had been tested after each list was learned. It is possible, therefore, that the indication of transfer effects found in that study might have been due to some process occuring during the reversal task rather than to the elaborational process itself. The purpose of the present study was thus twofold: (a) To test for the transfer effects of one or two experiences with paragraph elaboration relative to a control condition, and (b) to clarify the possible contribution of reversal experience to transfer.

Method

Subjects. Forty-two educable mentally retarded (EMR) children were employed as subjects in the present study. The children were randomly selected from five public schools on the basis of IQ and chronological age (CA), with the restriction that there be no evidence of gross sensory, motor, or speech defects. Subjects were matched on the basis of IQ, CA, and mental age (MA), and then were randomly assigned to five experimental conditions. Nine children were tested in four of the conditions and six children in the other (Group I). Three children were dropped following their transfer out of the St. Paul public school system. Mean IQs, CAs, and MAs for each treatment group are presented in Table 1.

Materials. The stimulus materials consisted of 48 colored pictures of common objects which were cut out of a preprimer workbook and then mounted on pieces of white cardboard (3.5 x 2.5 in). Twenty-four stimulus-response pairs were formed such that there were no

Table 1

Means and Standard Deviations of IQs, CAs, and MAs

for Five Treatment Groups

Treatment Group		IQ	CA (in months)	MA (in months)
Group I ($L-L-L_R$) n=6	$\bar{X}$	73.8	109.0	82.7
	SD	3.2	11.4	8.9
Group Ia ($L_R-L_R-L_R$) n=9	$\bar{X}$	73.7	110.1	83.3
	SD	3.0	8.1	6.8
Group II ($P-L_R-L_R$) n=9	$\bar{X}$	73.7	112.1	84.3
	SD	3.3	10.6	7.6
Group III ($P-P-L_R$) n=9	$\bar{X}$	73.2	113.7	84.9
	SD	3.4	11.3	8.5
Group IIIa ($P_R-P_R-L_R$) n=9	$\bar{X}$	73.6	112.0	84.2
	SD	2.9	7.1	5.4

L = Labeling experience

P = Paragraph experience

R = Reversal experience

obvious or common relations of sound or meaning between the items of a pair. With these pairs, three lists of eight pairs were formed by randomly assigning each pair to one list. For every pair, a two-sentence elaboration was constructed which related the two items in the pair. In each list, four of the pairs were elaborated within a "semantic" paragraph in which both the stimulus and response items occurred in the first sentence of the paragraph (e.g., "The dog is chasing the kite. He can't catch it."). The other four pairs in each list were related by means of a "syntactic" paragraph in which the stimulus item occurred in the first sentence and the response item in the second (e.g., "The socks are lost. Find them under the bed."). These two paragraph forms, which have been found not to differ in their effects on paired-associate learning (Turnure, 1971, cf. Thurlow & Turnure, 1971), occurred in alternate positions in each list.

Procedure. Two learning conditions (Paragraph and Labeling) were employed in order to test the transfer effects of verbal elaboration. Identical instructions were given for both conditions on all testing days. The conditions differed only in the verbalizations supplied to the subject during a single training trial which was given initially on each day of testing. The experimenter covered each response picture with the card bearing the stimulus item and then manually exposed them together for 15 seconds (timed by a stopwatch). During this period, the subject in the Paragraph (P) condition repeated a two-sentence paragraph given to him by the experimenter. In the Labeling (L) condition, the subject repeated the names of the stimulus and response

items after the experimenter. In order to equate the times required for the training trial in the two conditions, subjects in the Labeling condition were required to repeat the pair names twice during the 15 second period. The possible bias towards enhanced performance in the Labeling condition imposed by this procedure seemed necessary to somewhat control the activities engaged in by the Labeling subjects during the 15 second training intervals.

After the training trial, all subjects received the same learning task. The stimulus picture was exposed alone until the subject responded, up to a period of 20 seconds. If no response or an incorrect response was given, an error was scored. As soon as the subject responded, or after 20 seconds, the experimenter presented both the stimulus and response picture together for five seconds. Presentation of the eight paired-associates in this manner was termed a trial. Acquisition trials were continued until the subject reached a criterion of two successive errorless trials, up to 18 trials. In order to rule out positional cues, the experimenter changed the order of presentation of the pairs during each trial according to a prearranged random order. Learning scores were expressed both in terms of the number of trials to reach criterion and in terms of the number of errors made on the first acquisition trial. The latter measure was employed following Murdock's (1957) statement that transfer effects decrease as learning progresses on the transfer list, and Rohwer's (1966) suggestion that trials to criterion may be a less sensitive measure of the effects of elaboration

training than performance on the first trial.

In certain of the transfer conditions, a reversal manipulation (R) was introduced following acquisition on Days 1 and 2 in order to investigate its effects on transfer. All subjects were tested on reversal after the final day's list had been learned. In the reversal task, the stimulus and response items were interchanged immediately after the subject had learned to criterion (or after 18 trials). In other words, the subject was required to give the name of the stimulus item which corresponded to the response picture shown to him. The subject was not informed of the reversal, and the task continued in the same manner as in the acquisition stage. Each subject received two reversal trials for each list in which the reversal manipulation was introduced. Performance was measured in terms of the number of errors out of a possible 16.

A Rustrak event recorder was used to confirm the accuracy of experimental timing procedures during training and to measure the response latencies of each subject under the various experimental conditions. The latency of a response was defined as the time between the presentation of the stimulus picture by the experimenter and the subject's first complete response, regardless of whether it was correct or not. Timing measures were recorded during training, acquisition, and reversal on all three days of testing.

In order to test for the transfer effects of learning under an elaboration condition (paragraphs, P) to learning under a Labeling condition (L), three basic transfer conditions were examined: Group I received a L-L-L_R condition (i.e., Labeling on Day 1, Labeling on

Day 2, and Labeling plus reversal trials on Day 3), Group II a $P\text{-}L_R\text{-}L_R$ condition, and Group III a $P\text{-}P\text{-}L_R$ condition. Group I served to measure nonspecific transfer effects (e.g., warm-up, learning-to-learn, etc.) in addition to the effects of the labeling manipulation itself (cf. Runquist, 1966, p. 526). Group II provided a test of transfer effects after one elaboration experience, while Group III provided a test of transfer effects following two experiences with the paragraph elaborations. In addition to these groups, two outside controls were employed to identify any possible differential transfer effects that might result from the coupling of reversal experience with elaboration training. The inclusion of Group Ia ($L_R\text{-}L_R\text{-}L_R$), an outside control for Group I, and Group IIIa ($P_R\text{-}P_R\text{-}L_R$), an outside control for Group III, allowed for an evaluation of the effects of reversal experience on transfer.

For all groups, the testing days were separated by a period of at least 7 days. Each subject received a different list on each of the three test days. To control for possible effects of differential list difficulty, the order of presentation of the three lists was counterbalanced within each transfer condition.

Results

Acquisition

The mean numbers of trials to criterion and first trial errors for the five treatment groups are shown in Table 2. Calculation of a Pearson correlation coefficient between trials to criterion and error scores revealed that on all three days, there was a high

Table 2

Means and Standard Deviations of Trials to Criterion and First Trial Errors for Five Treatment Groups on three Test Days

Treatment Group		Trials to Criterion			First Trial Errors		
		Day 1	Day 2	Day 3	Day 1	Day 2	Day 3
Group I ($L\text{-}L\text{-}L_R$)	$\bar{X}$	7.50	7.33	6.67	6.83	6.67	6.83
	SD	3.78	2.42	1.21	1.19	1.21	.75
Group Ia ($L_R\text{-}L_R\text{-}L_R$)	$\bar{X}$	10.22	9.33	8.00	7.00	6.22	5.89
	SD	2.05	2.40	2.24	.71	1.39	1.36
Group II ($P\text{-}L_R\text{-}L_R$)	$\bar{X}$	3.67	9.67	9.44	1.67	6.22	5.67
	SD	1.80	5.38	4.80	1.22	1.30	1.41
Group III ($P\text{-}P\text{-}L_R$)	$\bar{X}$	3.56	3.56	6.33	1.78	2.11	4.11
	SD	1.59	1.24	4.15	1.92	1.54	1.62
Group IIIa ($P_R\text{-}P_R\text{-}L_R$)	$\bar{X}$	3.22	3.33	6.67	.78	1.22	5.00
	SD	.97	1.32	2.83	.67	.83	1.00

L = Labeling experience

P = Paragraph experience

R = Reversal experience

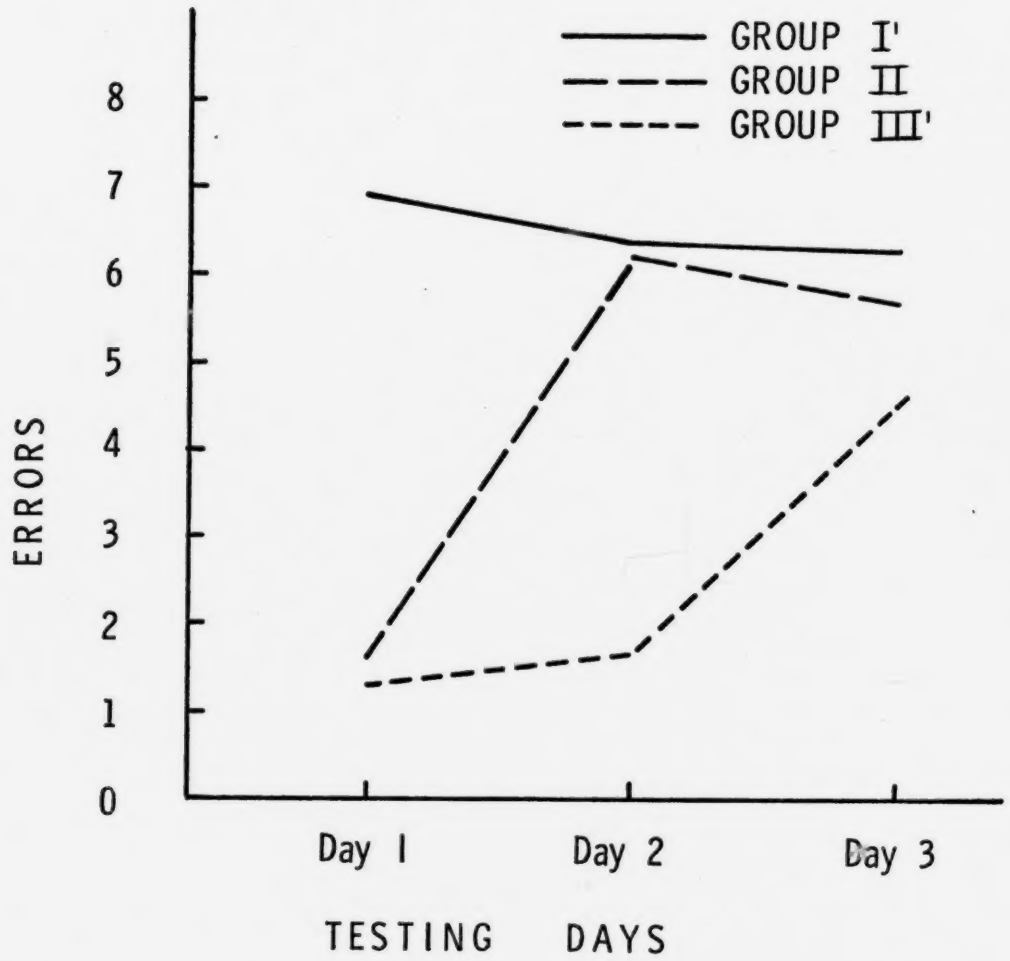
positive correlation between the two performance measures (Day 1: r=.82, df=40, $p < .001$; Day 2: r=.75, df=40, $p < .001$; Day 3: r=.43, df=40, $p < .01$). Because there were some discrepancies between individual trials to criterion and first trial error scores, however, both measures were analyzed throughout.

Initial analyses were made to determine whether or not reversal experience affected performance in such a way as to distinguish groups receiving identical learning conditions. To do this, Group Ia served as an outside control for Group I, and Group IIIa served as an outside control for Group III. Analysis of both trials to criterion and first trial errors revealed no differences in acquisition performances between Groups I and Ia and between Groups III and IIIa on any test day. As a result of this finding, Groups I and Ia were considered as one group, receiving a L-L-L_R condition (called Group I'), and Groups III and IIIa were considered as another group, receiving a P-P-L_R condition (called Group III'); Group II remained as was -- a P-L_R-L_R condition. This regrouping allowed for a comparison of three main treatment groups receiving the three basic transfer conditions: I' -- no paragraph elaboration experience; II -- one elaboration experience; and III' -- two elaboration experiences.

Figure 1 graphically presents the mean number of first trial errors for the three treatment groups on the three testing days. On the basis of previous findings (Turnure, 1971; Turnure & Walsh, 1971), it was expected that on Day 1, the groups receiving paragraphs (Groups II and III') would perform better than the groups receiving labels (Group I'). Analysis of the number of first trial

Figure 1

Mean First Trial Errors for Three Treatment Groups on Three Testing Days

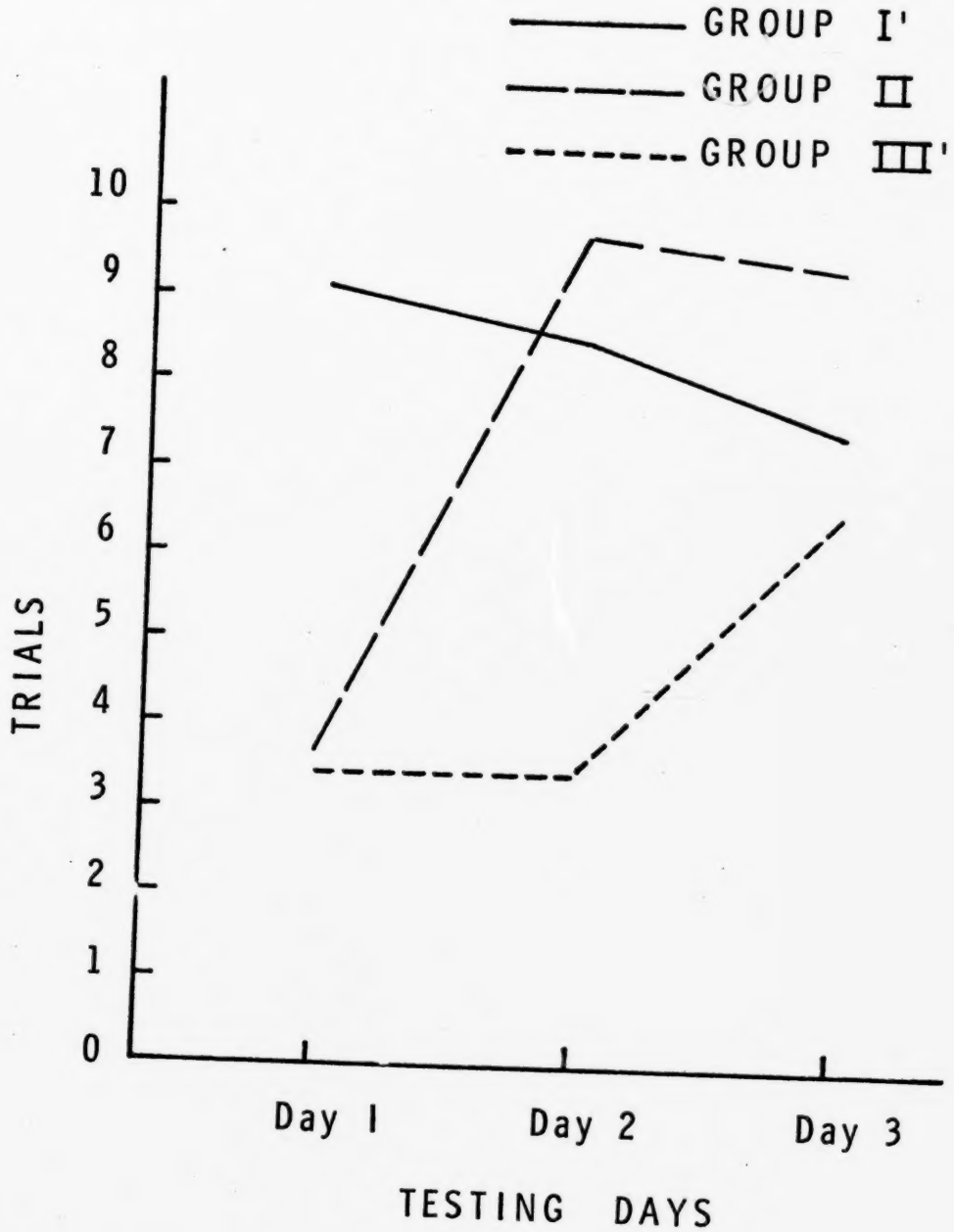


errors made on Day 1 supports this prediction (F=95.28; df=2,39; $p < .001$). Use of the Newman-Keuls procedure revealed that significantly more errors were made by subjects given labels during training than by subjects given paragraphs during training ($p < .01$). The two paragraph groups (II and III') did not differ. Analysis using trials to criterion as the dependent measure (see Figure 2) replicated these findings (F=35.06; df =2,39; $p < .001$).

Day 2 performance reflected practice effects for Groups I' and III', and a test of the transfer effects resulting from one experience with elaboration for Group II. The practice effects in Groups I' and III' were analyzed by means of a two factor mixed design (Conditions X Days) with repeated measures on one factor (Days). This analysis of first trial errors revealed only a significant conditions effect (F=234.86; df=1,31; $p < .001$); neither the Days ($F < 1$) nor the Days X Conditions interaction (F=2.58, df=1,31) was significant. Comparable results were obtained from the same analysis of trials to criterion (Condition effect: F=78.32; df=1,31; $p < .001$; Other effects: both F's < 1). Transfer effects on Day 2 were tested by a one-way analysis of variance, which revealed a significant difference in first trial errors (F=67.11; df=2,39; $p < .001$). Use of a Newman-Keuls procedure revealed that both groups which received labels that day (Group I' and Group II) made more errors than Group III', which received paragraphs ($p < .01$); the former two did not differ. Again, an analysis using trials to criterion replicated these findings (F=22.13; df=2,39; $p < .001$). It appears then, that

Figure 2

Mean Trials to Criterion for Three Treatment Groups on Three Testing Days



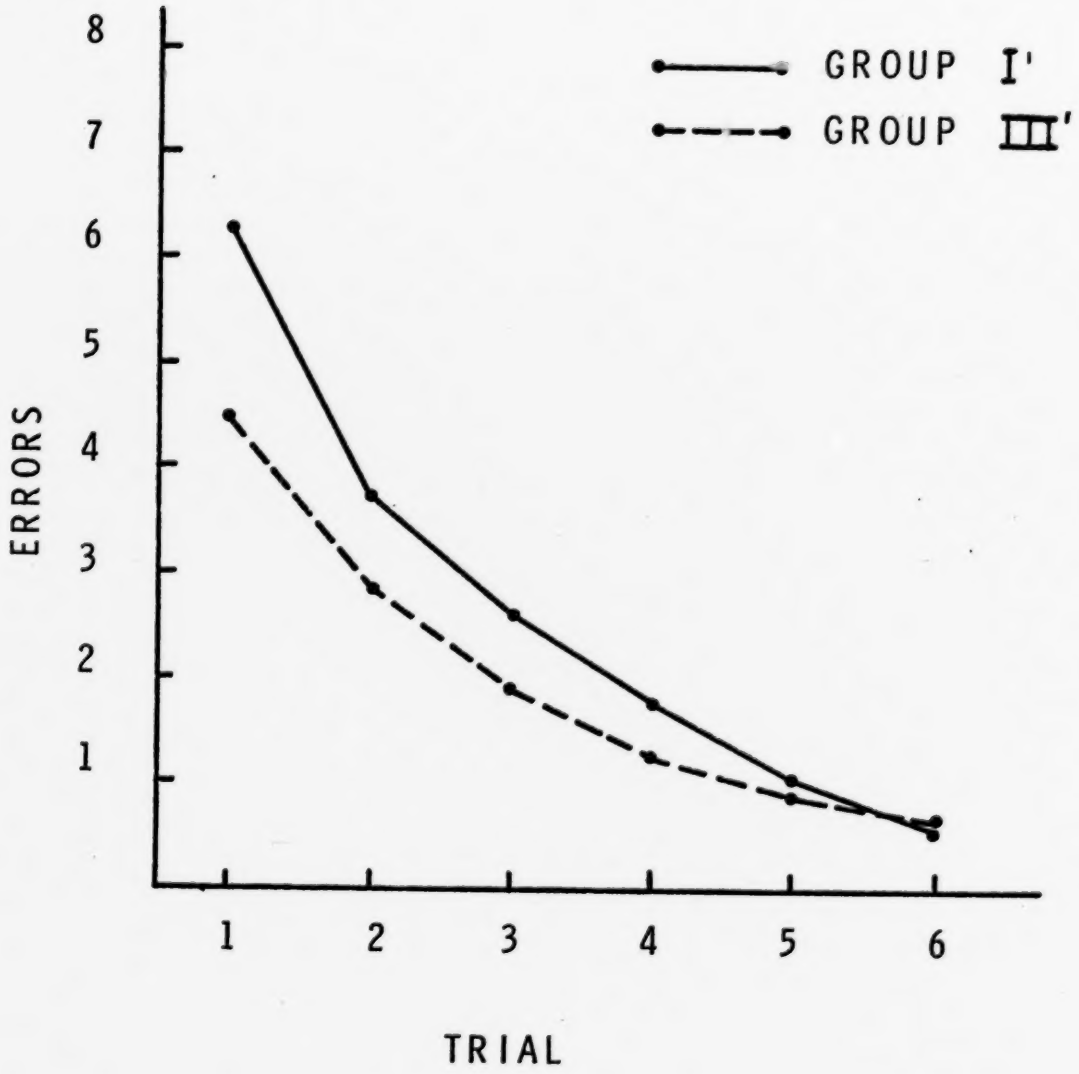
one elaboration experience does not provide transfer effects which differentiate performance from that of a group simply receiving practice in a labeling task.

The critical test for the existence of positive transfer effects following two experiences with paragraph elaboration (Group III') is performance on the third day of testing, when all subjects were presented the word pairs to be learned in a labeling condition. One would expect that if no transfer occurred as a result of two prior experiences with the elaboration condition, Groups I', II, and III' would perform at approximately the same level on Day 3. Observation of Figure 1 indicates that this was not the case. Group I', which was in a labeling condition on all three testing days, made 6.27 errors on the first Day 3 trial, Group II made 5.67, and Group III' made 4.56. A one-way analysis of variance used to test for transfer effects revealed the first trial error performance of the groups to be significantly different ($F=6.95$; $df=2,39$; $p < .005$). A Newman-Keuls test for differences among the means revealed that Group III' made fewer errors than either Group II ($p < .05$) or Group I' ($p < .01$). There were no significant differences between Groups I' and II. A similar analysis using trials to criterion as the measure of performance did not reveal any differences between the three groups on the third day of testing (see Figure 2). It appears that significant transfer effects resulting from two experiences with paragraph elaboration are evident only on the initial transfer trials (see Figure 3).

It should be noted, however, that not all subjects in Group III'

Figure 3

Mean Errors for Two Treatment Groups on first Six Trials of Day 3 Testing.



performed at a level which could be considered better than that of subjects given labels on all three days (Group I'). Five subjects in Group III' made six first trial errors on Day 3, an error rate which was quite common in Group I' on all days of testing. Although 72.2% of the Group III' subjects erred on less than five pairs on the first Day 3 trial and only 20.0% of the Group I' subjects did so, it appears that some subjects transferred following two days of paragraph training while others did not.

Reversal

Reversal performances were measured in terms of the number of errors made out of a possible 16. The mean error scores for the various treatment groups on the three test days are presented in Table 3. A two factor mixed design analysis (Conditions X Days), with repeated measures on the Days factor, was carried out on the reversal scores of the two outside control groups (Ia and IIIa), which received the reversal task on all three days. This analysis revealed only the conditions effect to be significant ($F=18.21$; $df=1,16$; $p < .001$). The finding that neither the Days nor the Days X Conditions interaction was significant (both F's <1) indicated that subjects given the reversal task following elaboration experience performed significantly better than subjects given the reversal task following labeling experience. This appeared to be the case on all testing days, even on the transfer day (Day 3), despite previous exposure to the task by both groups on Days 1 and 2.

Because of the failure to find significant practice effects

Table 3

Means and Standard Deviations of Reversal Errors

on Three Test Days

Treatment Group		Test Days		
		Day 1	Day 2	Day 3
Group I (L-L-L_R)	$\bar{X}$	----	----	2.00
	SD			2.37
Group Ia (L_R-L_R-L_R)	$\bar{X}$	2.00	2.22	2.11
	SD	1.73	2.11	1.90
Group II (P-L_R-L_R)	$\bar{X}$	----	2.11	1.33
	SD		1.96	1.73
Group III (P-P-L_R)	$\bar{X}$	----	----	.78
	SD			1.09
Group IIIa (P_R-P_R-L_R)	$\bar{X}$	.22	.33	1.00
	SD	.44	.50	1.32

from previous exposure to the reversal task, it seemed that there should be no reversal performance differences between the two outside control groups and their comparable experimental groups on Day 3. Analyses of variance confirmed that there were no differences between the reversal performances of subjects in Groups I and Ia and between the performances of subjects in Groups III and IIIa on Day 3. This finding supports the conclusion that subjects who receive elaboration experience on Days 1 and 2 perform in a superior fashion on a reversal task compared to subjects who receive labels on those two days. A one-way analysis revealed that Groups I' and III' were significantly different on Day 3 (F=4.36; df=1,31; $p < .05$). In other words, transfer effects following two elaboration experiences did appear to be quite strong on the reversal task as well as on the acquisition task.

Again, as in acquisition, Day 2 results suggested that one elaboration experience did not generally promote transfer effects. A one-way analysis of Day 2 reversal performances revealed that there were significant differences between the three conditions tested on the reversal task on that day. A Newman-Keuls procedure revealed that the two groups receiving labels (Groups Ia and II) made more errors than Group IIIa, which received paragraphs ($p < .05$); the former two did not differ. Apparently, the beneficial effects of elaboration training did not transfer to reversal performance following only one experience with the elaborations any more than it did to acquisition. Observation of Table 3 suggests, however, that

Group II subjects did show a striking improvement in performance from Day 2 to Day 3. Although this "practice effect" was significant (F=11.06; df=1,8; p <.025), the reason for it seemed to be unexplainable.

Response Latencies

Response latency analyses generally confirmed previous observations of condition differences on this measure (Thurlow & Turnure, 1971). One-way analyses of variance revealed significant condition effects on both Day 1 (F=17.12; df=4,37; p <.001) and Day 2 (F=6.26; df=4,37; p <.001) for mean overall response latencies. Use of a Newman-Keuls procedure revealed that on each day, the groups receiving paragraphs had significantly shorter mean overall latencies than the groups receiving labels (Day 1: p <.01; Day 2: p <.05). No significant effects were found on Day 3.

Response latencies included in the overall response latency measures were for three types of responses: correct responses, incorrect responses, and "no responses" (NR's). Further analyses of these latencies revealed that (a) on Day 1, groups receiving paragraphs had shorter mean response latencies for correct responses than did those receiving labels (p <.01), (b) no response latency differences existed between groups for incorrect responses on any test day, and (c) on both Days 1 and 2, groups receiving labels made a higher proportion of NR's (Day 1: F=7.32; df=4,37; p <.001; Day 2: F=2.74; df=4,37; p <.05). There were no differences on Day 3. It appeared that much of the difference between the overall response

latencies of groups receiving labels and those receiving paragraphs was related to the fact that those subjects receiving labels made a higher proportion of NR's, thereby increasing their overall latency scores.

Perhaps the most striking effect evident in the response latency data for all groups was the difference in latencies for correct and incorrect responses (see Table 4); *t*-tests of the differences between the means revealed that all were significant (all *p*'s < .02), except in the $P\text{-}L_R\text{-}L_R$ condition (Group II) on Day 1. The failure to find the large observed difference significant in this case appeared to be due to the smaller number of subjects making incorrect responses (n=3), and the fact that the mean incorrect response latencies for the subjects were based upon only one incorrect response. The results were quite consistent, with correct responses taking an average of 2.9 seconds across all conditions, regardless of whether the subject had received labels or paragraphs, and with all incorrect responses taking an average of at least 6.5 seconds.

Discussion

Certainly the most important result of the present study was the finding of quite clear transfer effects on Day 3 in the condition where subjects had been provided two previous experiences with the paragraph elaboration technique. Most of the EMR children tested for transfer of training after two separate experiences with such elaborations showed definite facilitation in performance on a test list presented without any experimenter-provided elaborations. The

Table 4

Mean Response Latencies for Correct and Incorrect Responses for Five Treatment Groups on Three Testing Days

Treatment Group	Day 1	2	3
Group I ($L\text{-}L\text{-}L_R$)			
Correct	3.0 (n=6)	3.2 (n=6)	3.1 (n=6)
Incorrect	7.9 (n=6)	6.5 (n=6)	6.9 (n=6)
Group Ia ($L_R\text{-}L_R\text{-}L_R$)			
Correct	3.5 (n=9)	3.4 (n=9)	3.8 (n=9)
Incorrect	7.7 (n=9)	7.1 (n=9)	7.6 (n=9)
Group II ($P\text{-}L_R\text{-}L_R$)			
Correct	2.4 (n=9)	3.0 (n=9)	3.2 (n=9)
Incorrect	8.4 (n=3)	8.1 (n 8)	7.7 (n=9)
Group III ($P\text{-}P\text{-}L_R$)			
Correct	2.4 (n=9)	2.4 (n=9)	3.1 (n=9)
Incorrect	7.2 (n=3)	8.8 (n=4)	7.3 (n=7)
Group IIIa ($P_R\text{-}P_R\text{-}L_R$)			
Correct	2.3 (n=9)	2.6 (n=9)	2.8 (n=9)
Incorrect	10.4 (n=3)	10.0 (n=2)	8.7 (n=8)

positive effects were observable in both the acquisition and reversal phases of list learning. The results on acquisition were significant, however, only when number of first trial errors was used as the dependent measure. It appears that the error measure may be more sensitive than trials to criterion as an index of elaboration and transfer effects, as Murdock (1957) and Rohwer (1966) have suggested.

The finding of positive transfer of elaboration training reported here stands in general opposition to results of previous studies, where no significant transfer effects were obtained (Jensen & Rohwer, 1963a; Milgram, 1967). Despite this fact, the overall results of this and the previous studies are not contradictory, since the results of the condition in the present study which most closely approximates the conditions of previous studies (i.e., Group II) are in complete agreement. That is, in the present study, experience with elaboration training on only one day was not found to be sufficient to promote transfer (see Group II's performance on Day 2), thereby replicating past failures to find transfer effects after one day's training (Jensen & Rohwer, 1963a; Milgram, 1967). It should be noted, however, that not all subjects performed poorly on the transfer list following only one previous elaboration experience. One subject in this condition made only four errors, and two others just five. The modal error rate, however, was six or seven errors, which was similar to the error rate of Labeling condition subjects. The effect of increasing the number of sessions of elaboration experience, therefore, seems to express itself primarily

through increasing the proportion of subjects who are likely to profit significantly from the training, rather than in improving everyone's performance incrementally (see also Turnure, et al., 1971, Study II).

The finding that, for EMR children, one elaboration experience produced results similar to those obtained by Jensen and Rohwer (1963a) and Milgram (1967) with instructionalized individuals, should not lead one to generalize the present finding of transfer following two elaboration experiences to the population of institutionalized retardates. Similarly, the results of a recently reported transfer study by Ross (1971) should not be generalized too broadly without further research. With EMR children, she found that extended training involving the use of mediation in a music program transferred to both motor and verbal paired-associate tasks. As in the present study, however, there is no basis for determining whether the failure to find transfer in the earlier studies could be attributed to population differences, or to the very minimal training procedures they used.

In attempting to obtain transfer of elaboration effects, the present study sought to clarify the possible role that a reversal task played in the indication of transfer in the study by Turnure and Walsh (1971). The results of the present study suggest that the effects obtained in that study were not attributable to the subjects' experiences with the reversal task. Apparently, the transfer effects suggested by Turnure & Walsh, and obtained here, are attributable to the transfer condition rather than any reversal

experience which followed the acquisition of item pairs.

Although research into the transfer of elaboration abilities has typically tested transfer at periods of one week to ten days following training, this interval seems to be somewhat removed from that which might be employed in an educational setting. The failure of studies supplying training on just one day to promote transfer (cf. Jensen & Rohwer, 1963a; Milgram, 1967) and the recently reported benefits of daily training experience with elaboration techniques (cf. Rohwer, 1971, p. 331), suggest that an important variable in promoting spontaneous elaboration may be the training interval employed. Investigations designed to determine optimal training intervals should be undertaken.

Even though the transfer effect appears to be quite strong when the number of first trial errors is analyzed, certain other findings of the present study may restrict the interpretation and the implications of the training procedures used here. In the first place, the Day 3 response latency data do not correspond to those which would be expected on the basis of Day 1 and Day 2 performances. Significant differences in overall response latencies were found between paragraph (Group III') and labeling (Group I') groups on both Days 1 and 2. The differences are quite strong, reaching a .001 probability level. On Day 3, however, no such differences exist ($F < 1$). Although it cannot be determined whether the lack of differences is due to practice effects on rapid responding over the three days, or to a failure of the rapid response to transfer following two paragraph training experiences, this disparity in

results is somewhat disturbing. Furthermore, the observation that five of the 18 Group III' subjects made six first trial errors suggests that the training procedures employed may not have promoted transfer in all subjects.

The transfer effects in acquisition and reversal performances are relatively strong, however, and should not be dismissed on the basis of the questions raised above. The results suggest that EMR children are able to transfer over a period of one week under very minimal "training" conditions such as those used here. They further suggest, however, that the transfer may not be as strong nor as pervasive as one might wish. It seems that more explicit training techniques are called for. As Ross (1971) suggests, "a training procedure having greater potential should emphasize the principle of mediational links in order that the retardate may effectively use available mediational opportunities." At a very basic level, it seems that the children should be instructed to think about and use elaborations because they will help them to remember the pairs they are to learn. Furthermore, as Stoff and Eagle (1971) suggest, subjects should not only be instructed to employ a certain strategy, but they should also be trained in the use of that strategy. Such a procedure might prove to be an effective technique for promoting strong and consistent spontaneous elaboration production in all EMR children to facilitate their paired-associate learning, and perhaps also for promoting the use of elaborational strategies within the classroom as well as in the experimental situation. In fact, recent classroom studies with EMR children (Bender, Taylor, Riegel, & Turnure,

1972; Taylor & Riegel, 1972) have indicated that both improved performance and increased awareness occur following strategy training sessions.

Finally, the data from the present study once again confirm the striking facilitative effects which result from the presentation of paired-associates within extended verbal contexts. On Day 1, where no specific transfer effects influence the results, subjects given paragraphs during training average 5.5 (68%) fewer first trial errors and take about 5.4 fewer trials to reach criterion than subjects who receive labels during training. Similarly, Day 1 reversal performance supports the finding that the performance of subjects given the reversal task following acquisition in an elaboration condition is significantly better than that of subjects given the reversal task following a labeling condition (Turnure, 1971; cf. Turnure & Walsh, 1971).

Furthermore, the response latency analyses suggest that, at least on Days 1 and 2, groups do differ in the quickness of their responding, depending upon whether they were trained in a labeling or a paragraph condition. Generally, the finding of longer response latencies for subjects trained with labels seems to be due to the generally longer time they require to give correct responses (Day 1), and the greater proportion of no responses they make (Days 1 and 2). In addition, the results provide support for the contention of Thurlow and Turnure (1971) that retarded children cannot necessarily be characterized as having slow mediational processes (cf. Penney, Seim, & Peters, 1968). Although the suggestion that retarded children

generally require more than six seconds to give a mediated response may be valid for certain tasks, the present study indicates that those tasks which employ verbal elaboration contexts as mediators seem to facilitate mediational processes in EMR children in such a way as to reduce the time needed for them to occur.

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Footnote

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